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The first, new species of the millipede family Pyrgodesmidae to be recorded in Vanuatu, Melanesia, southwestern Pacific (Diplopoda: Polydesmida)

Первый, новый вид диплопод семейства Pyrgodesmidae, отмечаемый из Вануату (Меланезия, юго-восточная часть Тихого океана)

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KEY WORDS: Pyrgodesmidae, *Lobiferodesmus*, new species, key, Vanuatu.

КЛЮЧЕВЫЕ СЛОВА: Pyrgodesmidae, *Lobiferodesmus*, ключ, Вануату.

ABSTRACT. *Lobiferodesmus vanuatu* sp.n. is described from Vanuatu, differing from both previously known congeners, *L. papuasicus* Silvestri, 1920 (type species) and *L. superans* Silvestri, 1920, from Papua New Guinea, by the presence of 19 body segments (instead of 20), the small size (<4 mm versus 9–10), the absence of porosteles from segment 7, the more evident lobulations at the front margin of the collum, the gonopod coxa provided with an apicolateral lobe, and the telopodite divided distally into two short branches, with the seminal groove passing distally between the bases of both these branches to terminate on top of a very small solenomere located at the bottom of a median cavity. A key is provided to all three congeners.

РЕЗЮМЕ. Из Вануату описан вид *Lobiferodesmus vanuatu* sp.n., отличающийся от обоих до сих пор известных видов рода, *L.. papuasicus* Silvestri, 1920 (типовой вид) и *L. superans* Silvestri, 1920, из Папуа-Новой Гвинеи наличием лишь 19, а не 20 сегментов тела, меньшим размером тела (менее 4 мм против 9–10), отсутствием поростелей на 7-м сегменте, более четкими дольками на переднем крае коллума, кокситом гоноподий с апикально-латеральным выростом и телоподитом, разделенным дистально на две короткие ветви, а также семенным каналом, проходящим дистально у основания этих двух ветвей и заканчивающимся на очень маленьком соленомере, расположенном на дне средней выемки. Составлен ключ для всех трех видов рода.

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Introduction

Vanuatu, formerly the New Hebrides, is a small archipelago in the Southwest Pacific. Like for most of the islands of Melanesia, very little information is available on the millipede fauna of Vanuatu. Only the following four, definitely introduced, "tramp" species have hitherto been reported from there:

(1) *Oxidus gracilis* (C.L. Koch, 1847) (Polydesmida: Paradoxosomatidae) — subcosmopolitan, recorded from Efate, limestone plateau N Maati, 100 m, by Shelley & Lehtinen [1998].

(2) *Orthomorpha coarctata* (DeSaussure, 1860) (Polydesmida: Paradoxosomatidae) — pantropical, recorded from Aoba, Ndui Ndui; Efate, Vila; Emae, Mt. Tavani Talinasa, 434 m; Espirito Santo, Second Channel; Luganville and a nearby hill; Malakula, Lamap; Tanna, Lenakel, all by Shelley & Lehtinen [1998].

(3) *Anoplodesmus saussurei* (Humbert, 1865) (Polydesmida: Paradoxosomatidae) — pantropical, recorded from "New Hebrides" by Shelley & Lehtinen [1998].

(4) *Leptogoniulus sorornus* (Butler, 1876) (Spirobolida: Pachybolidae) — pantropical, recorded from Port-Vila by Brolemann [1931] and from Aoba, Efate, Es-



Fig. 1. *Lobiferodesmus vanuatu* sp.n., ♂ paratype. Habitus, lateral view. Photographed not to scale.

Рис. 1. *Lobiferodesmus vanuatu* sp.n., паратип ♂. Габитус, вид сбоку. Сфотографировано без масштаба.

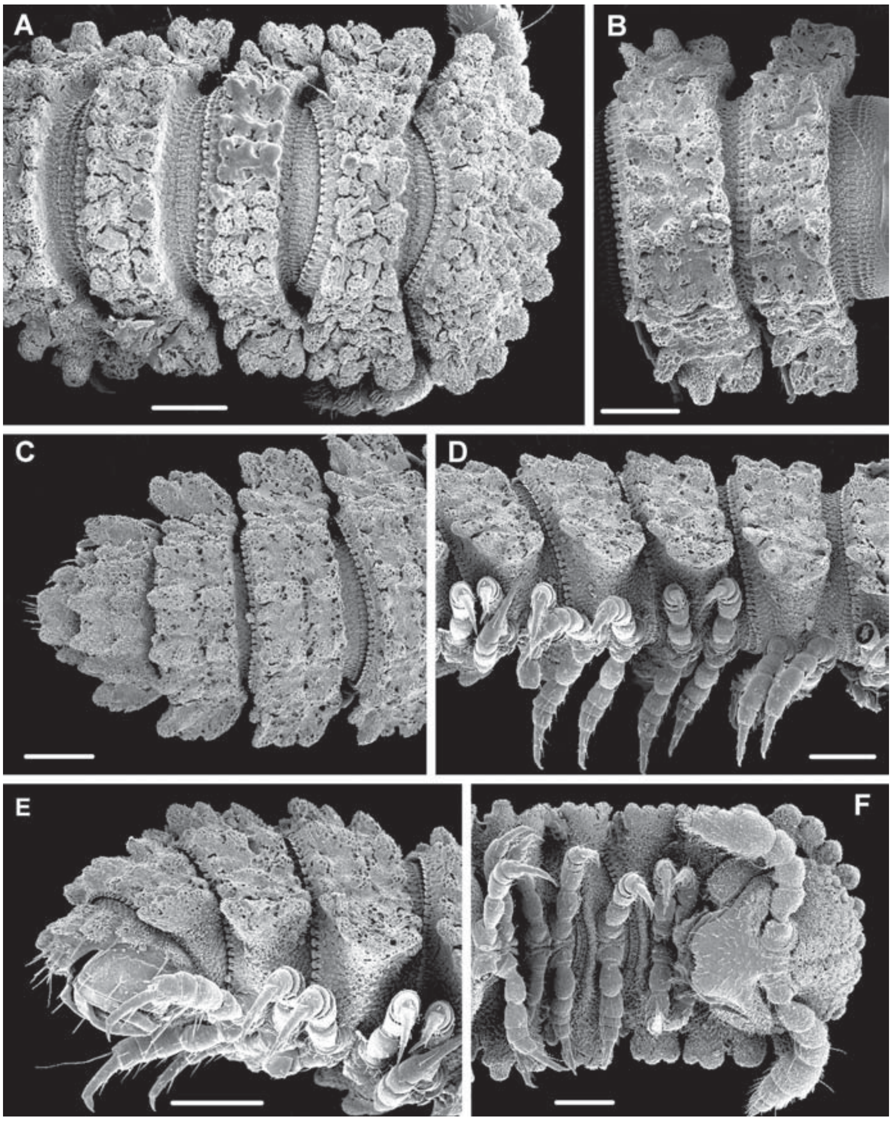


Fig. 2. *Lobiferodesmus vanuatu* sp.n., ♂ paratype: A — anterior part of body, dorsal view; B — midbody segments, dorsal view; C — posterior part of body, dorsal view; D — midbody segments, lateral view; E — posterior part of body, lateral view; F — anterior part of body, ventral view. Scale bars in µm.

Рис. 2. *Lobiferodesmus vanuatu* sp.n., паратип ♂: A — передняя часть тела, вид сверху; B — среднетуловищные сегменты, вид сверху; C — задняя часть тела, вид сверху; D — среднетуловищные сегменты, вид сбоку; E — задняя часть тела, вид сбоку; F — передняя часть тела, вид снизу. Масштаб в мкм.

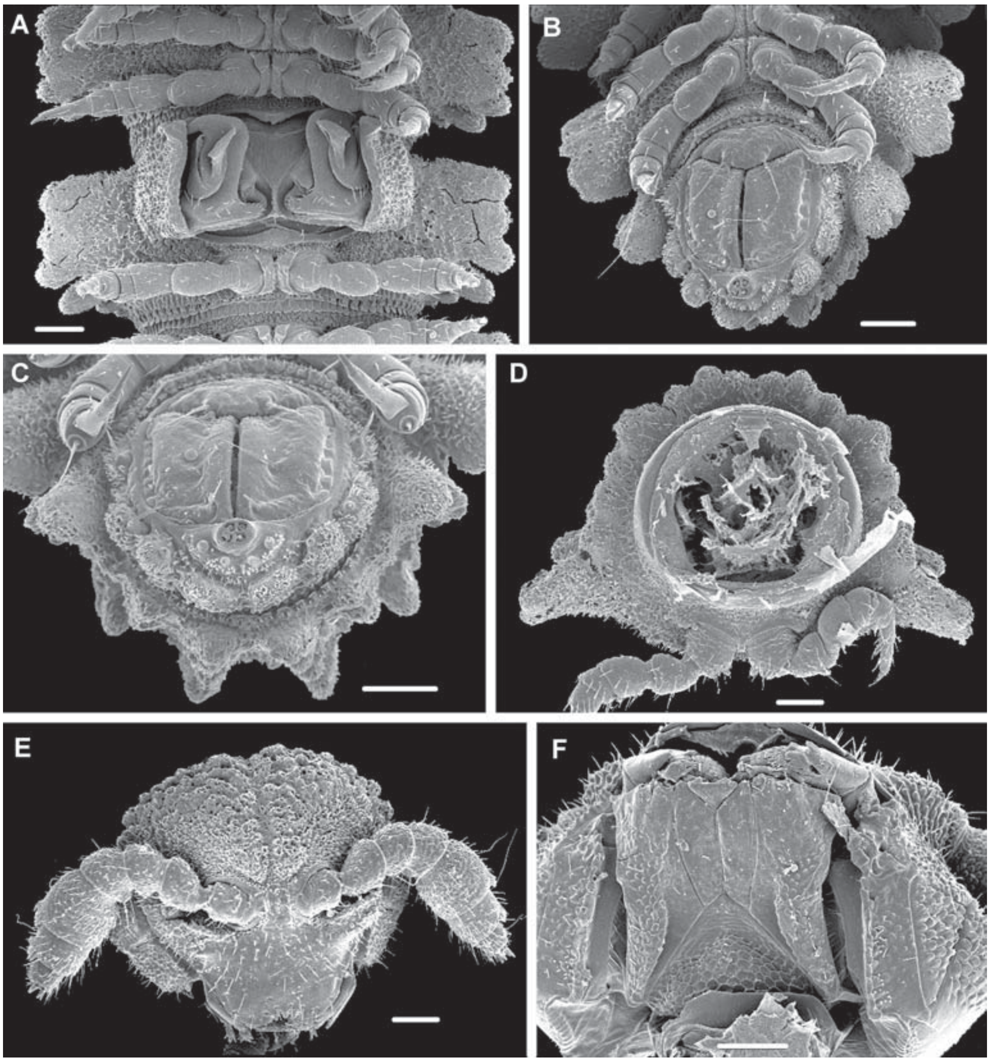


Fig. 3. *Lobiferodesmus vanuatu* sp.n., ♂ paratype: A — body segments 6–8, ventral view; B — posterior part of body, ventral view; C — telson, ventrocaudal view; D — cross-section of a midbody segment, caudal view; E — head, front view; F — gnathochilarium, ventral view. Scale bars in µm.

Рис. 3. *Lobiferodesmus vanuatu* sp.n., паратип ♂: A — туловищные сегменты 6–8, вид снизу; B — задняя часть тела, вид снизу; C — тельсон, вид снизу и сзади; D — поперечный разрез среднетуловищного сегмента, вид сзади; E — голова, вид спереди; F — гнатохилярий, вид снизу. Масштаб в мкм.

piritu Santo, Malekoula, Tanna and Vanua Lava by Shelley & Lehtinen [1999].

All the more interesting it was to have received recently for study a small collection of Diplopoda made by Berlese extraction of forest litter and soil on the main island of Espirito Santo and the adjacent Malo Island by L. Deharveng, A. Bedos (Paris, France) and their collaborators. Among these samples, which naturally contained only very small species, there were two Polydesmida rather abundantly represented by males. One of these, a haplodesmid, will be put on record elsewhere [Golovatch et al., in preparation] while the other, a tiny pyrgodesmid, is being described here.

The holotype and most of the paratypes are kept in the collection of the Muséum national d'Histoire naturelle, Paris, France (MNHN), with a few paratypes shared also with the collections of the Zoological Museum, State University of Moscow, Moscow, Russia (ZMUM) and Natural History Museum, University of Copenhagen, Copenhagen, Denmark (ZMUC).

SEM micrographs were taken using a JEOL JSM-6480LV scanning electron microscope. After examination, SEM material was removed from stubs and returned to alcohol, all such samples being kept at MNHN.

Taxonomy

Lobiferodesmus vanuatu **sp.n.**
Figs 1–6.

MATERIAL. HOLOTYPE ♂ (MNHN JC 316), Vanuatu, Espiritu Santo, Natawa, Arifos Forest, Berlese extraction of litter, 21.09.2006, leg. L. Deharveng & A. Bedos (SK06-21/17). – Paratypes: 2 ♂♂ (MNHN JC 316), Espiritu Santo, Funafus, Riorua Forest, Berlese extraction of soil, 17.09.2006, leg. L. Dehar-

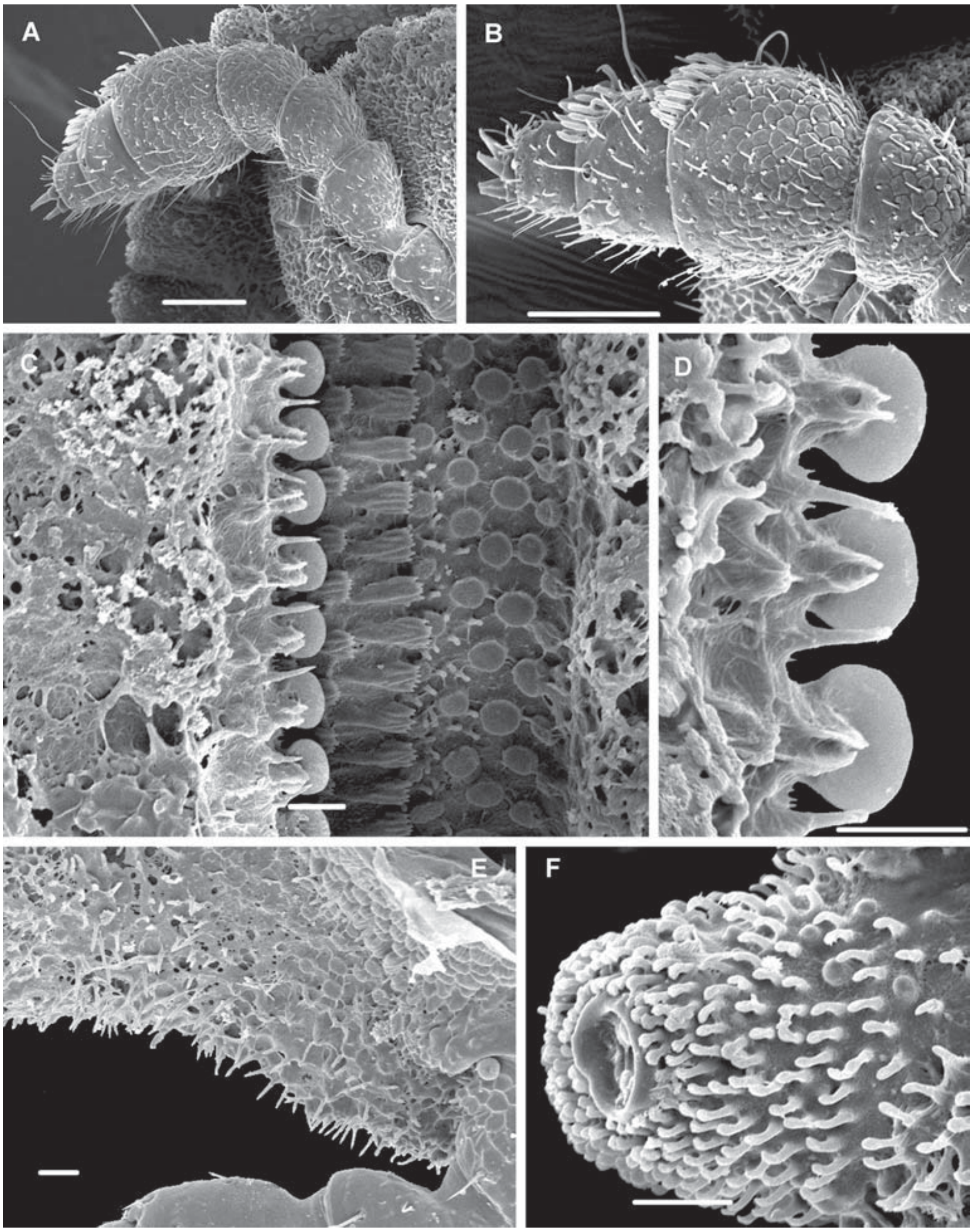


Fig. 4. *Lobiferodesmus vanuatu* sp.n., ♂ paratype: A — antenna; B — distal part of antenna; C — tergal texture; D — limbus; E — ventral texture; F — porostele, dorsal view. Scale bars in µm.

Рис. 4. *Lobiferodesmus vanuatu* sp.n., паратип ♂: A — антенна; B — дистальная часть антенны; C — текстура верха; D — лимбус; E — текстура низа; F — поростель, вид сверху. Масштаб в мкм.

veng & A. Bedos (SK06-17/14); 1 ♂, 2 ♀♀ (ZMUM), same locality, Berlese extraction of litter, 17.09.2006, leg. L. Deharveng & A. Bedos (SK06-17/13); 2 ♂♂ (MNHN JC 316), Espiritu Santo, Malo Island, Avorani Forest, Berlese extraction of litter, 15.09.2006, leg. L. Deharveng & A. Bedos (SK06-15/04); 2 ♂♂, 1 ♀, 1 juv. (ZMUC), same locality, Berlese extraction of litter, 15.09.2006, leg. L. Deharveng & A. Bedos (SK06-15/13); 3 ♂♂, 1 juv. (MNHN JC 316), same locality, Berlese extraction of litter, 15.09.2006, leg. L. Deharveng & A. Bedos (SK06-15/10); 1 ♂, 1 ♀, 2 juv. (MNHN JC 316), Espiritu Santo, Natawa, small Arifos doline, Berlese extraction of litter, 24.09.2006, leg. L. Deharveng & A. Bedos (SK06-24/22); 1 ♀ (MNHN JC 316), same locality, litter screening, 24.09.2006, leg. L. Deharveng & A. Bedos (SK06-24/24); 1 ♂, 2 juv. (MNHN JC 316), Espiritu Santo, Boutmas, Fapon doline 3, Berlese extraction of litter, 05.09.2006, leg. L. Deharveng & A. Bedos (SK06-05/18); 1 ♀ (MNHN JC 316), Espiritu Santo, Boutmas, Wanror, forest on limestone, Berlese extraction of soil, 12.09.06, leg. J. Lips (SK06-12/14); 1 ♂, 2 ♀♀ (MNHN JC 316), 1 ♂ (SEM), Espiritu Santo, Nambel, near Amarur Cave, forest on limestone, 06.09.2006, leg. Cahyo Rahmadi (SK06-06/11).

NAME. A noun in apposition, to emphasize the provenance of the new species.

DIAGNOSIS. Differs from both hitherto known congeners by the presence of 19 body segments (instead of 20), the small size (<4 mm versus 9–10), the absence of porosteles from segment 7, the more evident lobulations at the front margin of the collum, the gonopod coxa provided with an

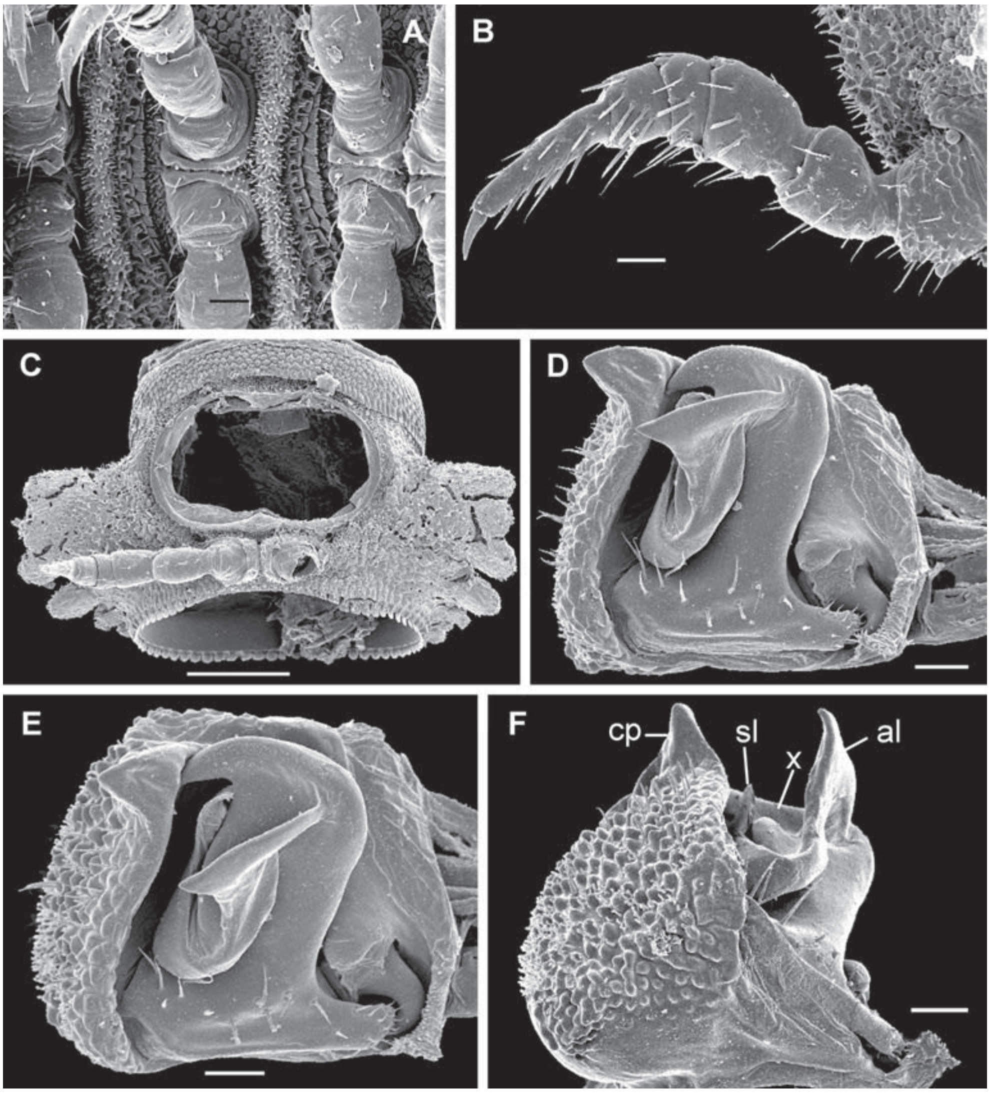


Fig. 5. *Lobiferodesmus vanuatu* sp.n., ♂ paratype: A — sternites, ventral view; B — midbody leg; C — body segment 7, ventral view; D–F — gonopods, ventral, submesal and sublateral views, respectively. Scale bars in μm.

Рис. 5. *Lobiferodesmus vanuatu* sp.n., паратип ♂: A — стерниты, вид снизу; B — средне туловищная нога; C — 7-й туловищный сегмент, вид снизу; D–F — гоноподии, соответственно снизу, близкий с медиальному и близкий к боковому виды. Масштаб в мкм.

apicolateral lobe, and the telopodite divided distally into two branches, with the seminal groove passing distally between the bases of both these branches to terminate on top of a very small solenomere located at the bottom of a median cavity.

DESCRIPTION. Body with 19 segments in both sexes (Fig. 1). Holotype: length 3.4 mm, maximum width of midbody segments 0.51 mm; diameter of prozona 0.29 mm; head 0.35 mm (cephalic capsule) or 0.38 mm wide (including mandibular stipes); collum 0.50 mm wide; antenna 0.40 mm long and 0.08 mm high (antennomere 5). Females up to 3.48 mm long, 0.52 mm wide; diameter of prozona 0.32 mm; head (cephalic capsule) 0.36 mm wide; collum 0.48 mm wide; antennomere 5, 0.07–0.08 mm high.

Coloration: terga, paraterga and head above antennal sockets marbled light brown to dark brownish; venter whitish to very light brown; remaining parts (antennae, prozona, pleura, porosteles, legs, hypoproct and paraprocts) whitish (Fig. 1).

Head (Figs 2F, 3E) slightly transverse, surface above antennal sockets densely granulose, epicranial suture evident; labral and supra-labral surface sparsely setose.

Antennae (Figs 3E, 4A, B) claviform and stout like in most other Pyrgodesmidae, texture mostly microgranulate-scaly; four basal antennomeres short and transverse; antennomere 5 subcylindrical, slightly longer than high, distolaterally with a compact group of numerous bacilliform sensilla; a similar but smaller group of shorter sensilla also present on antennomere 6; antennomere 7 particularly small, topped by the usual four sensilla. Antennomere 4 with a shorter, 5 and 6 each with a very long, lateral, tactile seta. Gnathochilarium (Fig. 3F) of usual shape and structure, texture mostly alveolate; basal half of stipes on both sides with a longitudinal bulge.

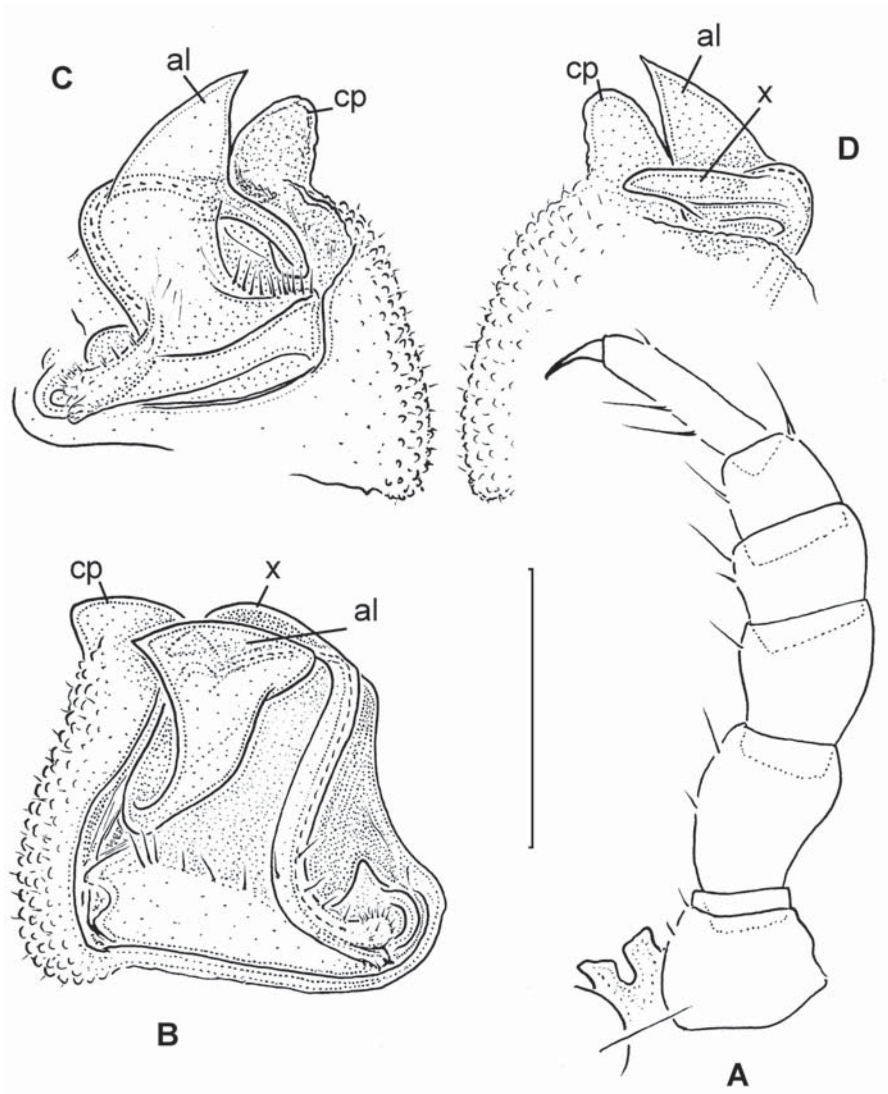


Fig. 6. *Lobiferodesmus vanuatu* sp.n., ♂ paratype: A — leg 7, caudal view; B–D — gonopods, mesal, submesal and sublateral views, respectively. Scale bar: 0.1 mm.

Рис. 6. *Lobiferodesmus vanuatu* sp.n., паратип ♂: A — 7-я нога, вид сзади; B–D — гоноподии, соответственно медиальный, близкий к медиальному и близкий к боковому виды. Масштаб 0,1 мм.

Anterior margin of collum (Figs 2A, F) with 5+5 very evident lobulations, remaining surface of collum multituberculate.

Metaterga with three transverse, rather regular rows of 8+8 rather small tubercles (Figs 2A–E, 3A, B). Among these tubercles, 2nd and 5th counting from axial line a little larger and higher than others, particularly on last few segments (notably segment 18), and forming 2+2 paramedian crests (Fig. 2E).

Ozopores borne on evident porosteles (Fig. 4F) present only on segments 5, 9, 12 and 15, invisible (= absent?) on segments 7 and 16–18 (Figs 2A–E). Paraterga strongly declivous (Fig. 3D), of these four, obviously poriferous, segments trilobate laterally, caudal lobe being evidently removed from both preceding, barely distinguished lobules (and from next one at caudal margin) and represented by a distinct, elongate, conical porostele. Poreless segments (without porosteles) also trilobate, but these lobulations similar and weakly developed, clearly distinguished only on paraterga 2. Only paraterga 18 with a single, broad, lateral lobe slightly directed caudad (Fig. 2C). Most paraterga with a very clear, rounded, additional lobulation above porostele or 3rd lobule at caudolateral margin, this lobulation growing less distinct toward telson (Figs 2A–E). Metaterga and paraterga (from above and from below) covered with a cerotegumental crust, prozona finely but clearly alveolate, sternal region partly abundantly microspiculate (Figs 2, 4C, E, 5A). Limbus evidently micrcrenulate (Figs 4C, D). Epiproct partly visible from above (Fig. 2C), hypo- and paraprocts usual (Figs 3B, C).

Sterna deeply impressed between coxae, with a remarkable pair of short paramedian tubercles in both sexes (Figs 5A, 6A). Gonopod aperture large, transverse-oval (Figs 3A, 5C). Legs (Figs 5B, 6A) short, slightly enlarged in both sexes, with a simple claw (3.5 times longer than its basal width and very sharp in 2/3 distal part).

Gonopods (Figs 5D–F, 6B–D) with stout, subglobose, microtuberculate and setose coxae forming a distinct median cavity for accomodation of short and similarly stout telopodites. Distolateral part of coxa with an apical lobuliform process (cp) and a small cannula. Telopodite with an evident, apicoventral, subtriangular and pointed lobe (al), a broadly rounded, prominent, anterior ridge with an apicolateral, digitiform, nearly pointed tooth (x), and a median cavity between cp, al and x. Seminal groove running first mesally, then turning anterolaterally between bases of al and x to terminate on a very small solenomere branch (sl) located at bottom of the median cavity.

REMARKS. The small genus *Lobiferodesmus* Silvestri, 1920 has hitherto been known from two species, *L. papuasicus* Silvestri, 1920 (type species, described from male material alone) and *L. superans* Silvestri, 1920 (described from female material alone), both from Sattelberg in Papua New Guinea [Silvestri, 1920]. Thus, like in *L. papuasicus*, the telopodite of the gonopods in the new species is remarkably short and stout, being nearly completely sunken into the gonocoel formed by subglobose and strongly developed coxae. The distal part of the telopodite is similarly enlarged, folded and forming a median cavity that seems to mark the end of the seminal groove. Unfortunately, the description and illustrations of the gonopods in *L. papuasicus* are too schematic [Silvestri, 1920] to allow further comparisons. However, even they clearly show that, in contrast to *L. vanuatu* sp.n., the gonocoxa of *L. papuasicus* is devoid of an apical projection whilst the basal ("femoral") part of the gonotelopodite is considerably narrower. In addition, there seems to be no solenomere in *L. papuasicus*.

The new species not only agrees rather well with the original diagnosis of the genus, but the trio also show a coherent distribution pattern. Whether *L. vanuatu* sp.n. is endemic to Vanuatu or not, is impossible to establish at the present, against the background of such generally very poorly known faunas of the numerous archipelagos in Melanesia, Indonesia and off New Guinea.

With the discovery of this new species, the diagnosis of *Lobiferodesmus* is slightly to be amended as regards body size, ozopore formula, the number of body segments etc. However, based both on peripheral and gonopod characters, as well as distribution, it is quite evident that this genus is the best to allocate *L. vanuatu* sp.n. into.

Below is a key to all three species of *Lobiferodesmus*:

1. Body with 19 segments in both sexes (Fig. 1). Collum with a row of 5+5 distinct lobulations at front margin (Fig. 2A). Porosteles present only on segments 5, 9, 12 and 15. Paraterga mostly trilbate laterally (Figs 2A–E). Gonopods as in Figs 5D–F, 6B–D; coxa with an evident apicolateral lobe (cp); distal 2/3 of telopodite subequally broad, with an apparent subtriangular lobe (al) and a slightly more distal ridge with a lateral tooth (x). Vanuatu .... *L. vanuatu* sp.n.
— Body with 20 segments. Collum with a row of 5+5 indistinct lobulations at front margin. Porosteles present on segments 5, 7, 9, 12 and 15. Paraterga mostly distinctly bilbate laterally. Male, when known (*L. papuasicus*), with gonopod coxa devoid of apicolateral lobe; basal half of telopodite much narrower than distal one. New Guinea 2
2. Midbody paraterga slightly broader, less strongly declined and placed in basal half of segments. Larger 2+2 paramedian rows of tubercles on midbody metaterga barely higher than others .... *L. papuasicus*
— Midbody paraterga narrower, more strongly declined, lying in basal third of segments. Larger 2+2 paramedian rows of tubercles on midbody metaterga considerably higher than others .... *L. superans*

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